[Behnes' Seven Ages.]

THE SEVEN AGES.

The above drawing has been made from a sculpture in marble, in low relief, by Mr. Behnes. It is a representation of seven successive stages of human life—not strictly the Seven Ages of Shakspere, but obviously modelled from the masterly sketches of the poet, with such alterations as the artist deemed necessary to give something of classic dignity to the representation, and such allegorical additions as were required to make the subject intelligible, and to fill the circular space in which the groups are enclosed.

Jacques, in Shakspere's 'As you like it,' whose graphic descriptions have supplied the groundwork of Mr. Behnes' composition, is a humorist of very peculiar character, habitually disposed to dwell on the undignified, the ludicrous, and the degrading circumstances of human life, rather than on those of a more elevated and ennobling character. In his description, the infant is "mewling and puking;" the schoolboy is "whining," and "creeping like snail unwillingly to school;" the lover has made "a woful ballad to his mistress' eyebrow;" the soldier is "bearded like a pard;" the justice has a "fair round belly;" the pantaloon has "shrunk shanks;" and the last age of all is "second childishness."

The artist, in the work before us, has avoided these degrading circumstances, which Jacques, in the indulgence of his satirical taste, has introduced. The state of infancy is here shown by four figures, two of which, encircled by a mantle, are almost helpless, while the other two are playfully blowing bubbles. Two boys, one of whom is drawing geometrical figures which the other is contemplating, represent the schoolboy age. The lover is apparently in a sort of waking dream, the little winged Cupid who sits upon his shoulder having no doubt suggested to his imagination the vision of that lovely and loosely-draped female who is smiling behind him, and whose perfections he seems to be endeavouring to immortalize in a sonnet. The warrior, in an attitude of excitement, with a short sword in his right hand and a banner in his left, fills the centre of the composition. A dead body is at his feet, while, over his head, Fame, with outspread wings, is proclaiming his deeds through her trumpet, holding at the same time a wreath of laurel with which she is about to crown him. The justice is here a dignified figure, apparently a judge, in senatorial robes, with a

naked culprit bound at his feet, while an allegorical figure behind holds with one hand the scales of justice and with the other the fasces, the emblem of punishment. The figure of an aged man, holding an eyeglass, by the aid of which he appears to be poring over an ancient manuscript, is substituted for that of the pantaloon, with "spectacles on nose," as the representative of the sixth age. The "last scene of all," that of extreme age and decrepitude, completes the artist's circle of human existence, the helplessness of old age and of infancy being thus brought into juxtaposition.

As the subjects of the composition have no reference to any particular period or nation, the artist has very properly avoided the introduction of costume, except in one or two instances, in which it would perhaps have been better omitted. The warrior, for example, is sufficiently indicated without the helmet, which, as the rest of the body is uncovered, seems to be unnecessary, especially as Fame thus appears to be about to place the wreath on the helmet, instead of the head. The book under the arm of the naked boy looks oddly, and might very well have been omitted, the attitude of attention of one of the boys to the figures drawn by the other clearly enough indicating that they are students.

The artist, we think, would have pleased more if he had been less ambitious to exhibit his skill by the display of the naked form, the disposition of some of the drapery which a sense of propriety has compelled him to introduce being unnatural, and therefore ungraceful. The grouping is well arranged, and the composition as a whole is very creditable to the artist, but is hardly sufficiently marked by originality of character or distinctness and power of expression to place the work in the highest class of art.

THE MOVEMENT OF SHINGLE-BEACHES.

THERE are a few interesting circumstances connected with the *shingles* or pebbly beaches so extensively spread along the south coast of England. Every water-side visitor knows something of these—that they are formed of rounded and water-worn pebbles of various sizes; that they slope very gently towards the sea; that they occur sometimes on a flat coast and sometimes between the cliffs and the sea; and that they are more or less washed by every tide. But it is not so generally known how these shingle-beaches interfere with the ports and harbours on the southern coast. Mr. Palmer communicated a paper to the Philosophical Transactions in 1834, which gives instructive details on this point.

It appears that the whole of the shingle has a general eastward movement along the south coast of England, that is from Cornwall onward towards Kent. The currents and tides which flow in from the Atlantic drive this shingle before them, and heap it up on the shore, where it gets gradually shifted along from west to east. These pebbles consist of fragments which have been broken from off the cliffs, or have been brought down by the rivers, and which have become rounded by the action of the water. The more they are worn, the smaller they become, and hence arise all varieties of size from grains of sand up to large stones. Sometimes the shingle merely lies along the coast, forming the well-known "beach" of our southern watering-places; while in other cases, through the action of particular currents, or the contour of the coast, they become grouped up in enormous masses. For instance, the western end of the channel which divides the Isle of Wight from Hampshire, called the Solent, is crossed for more than two-thirds of its width by the shingle-bank of Hurst Castle, which is about seventy yards broad by twelve feet high, presenting an inclined plane to the west. This bank consists of a bed of rounded chalk-flints, resting on a submarine clayey base. The flints and pebbles are derived from the waste of the Hordwell cliffs to the westward. In the great storm of November, 1824, this bank was moved bodily forwards for forty yards towards the north-east; and certain piles, which served to mark the boundaries of two manors, were found after the storm on the opposite side of the bar. A still more remarkable accumulation of shingle is the Chisel bank, which connects Portland with the mainland. This consists of a ridge of shingle about seventeen miles in length by a quarter of a mile broad; and the pebbles with which it is formed are chiefly flinty, all loosely thrown together, and rising to the height of from twenty to thirty feet above the ordinary high-water mark. This shingle rests on a ledge of rocks situated at a depth of only a few yards beneath the surface of the sea; and this ledge doubtless formed a barrier against which the shingle has accumulated.

Mr. Palmer points out three kinds of movements to which the shingle is subjected, and which, together or separate, have led to the partial blocking up of many harbours on the southern coast. In the first, the sea heaps up or accumulates the loose pebbles against the shore; in the second, the sea breaks down the accumulations previously made; and in the third, the sea removes or carries forward the pebbles in a horizontal direction. The three may therefore be characterized as accumulation, disruption, and progression.

Supposing the shingle to be lying along the shore, the first movement to which it is subjected is to be driven obliquely forward, rather up the shore and rather eastward. It is believed that the waves effect the greater part of this movement, and not currents. Every breaker is seen to drive before it the loose materials which it meets; these are thrown up on the inclined plane of the shore on which they rest, and in a direction corresponding generally with that of the breaker. Most of the winds on the southern coast are from the south-west, and the waves thus generated throw up the shingle in a north-east direction. In most cases it has been observed, that the finer particles descend the whole distance with the returning breaker, unless accidentally deposited in some interstices; but the larger pebbles return only a part of the distance; and it is further observed that the distance to which each pebble returns bears some relation to its dimensions: this indicates the process of accumulation. In other instances, depending on the wind, it is found that pebbles of every dimension return with the breakers which forced them up the beach, and that these are accompanied also by others which had been previously deposited, but which are in some cases disturbed by the waves; and by a continued repetition of the breakers acting in this manner, the whole of the shingle previously accumulated is immersed below the surface of the water: this indicates the process of disruption.

Mr. Palmer thus explains how it is that the larger pebbles are driven higher up the beach than the smaller. We may consider the beach to be an inclined plane, with the waves flowing towards it in an angular direction, say from the south-west. The waves carry with them pebbles of various sizes obliquely up this inclined plane; and when at the summit, each wave breaks partly into spray, which is dispersed in all directions; another part is absorbed; while the remainder flows back again in a shallow form, which rapidly diminishes in its depth; so that the pebbles are soon left exposed, and do not return the whole distance with the water, but are left at rest at a higher level than that from whence their motion commenced. With

the rise of the tide, the striking force becomes similarly elevated; and the pebble is driven farther up the shore in an oblique direction, not falling to so low a depth as that from which it had risen. A pebble of smaller dimensions will be driven upward and onward in the same way, but to a smaller distance; because, from its surface being greater in proportion to its weight, and from its remaining longer immersed in the declining wave, on account of its smaller bulk, it will descend farther with the retreating wave. A pebble of yet smaller size would sink yet farther with the retreating wave; from which it follows that, in a general way, the larger pebbles travel faster onwards and upwards than the smaller. It has been observed by those who attend to the subject, that when this action of the waves has continued equally through a tide, the pebbles are left in tolerably regular order according to their dimensions, the largest being uppermost, and the smallest at the bottom of the beach.

Mr. Palmer has found that the heaps of shingle on a beach are either accumulated or destroyed according to the rapidity with which the waves or breakers succeed each other. When less than eight breakers follow in a minute, the accumulative action which we have just described goes on; but when they are as rapid as ten in a minute, the waves, instead of accumulating more pebbles on the beach, wash away those which had before been accumulated. This curious result is thus explained: that although these rapid waves become dispersed and broken in the same way as the slower ones, yet they follow in such rapid succession, that each wave rides over its predecessor while on its return, and thus produces a continual downward current which carries with it the pebbles that were disturbed. The pebbles are not removed far below the line of low water, and are driven up again when the waves become less rapid. Mr. Palmer observed facts in 1833 which seemed to agree with these views. A rapid succession of waves for five successive tides washed away large heaps of shingle which had accumulated near Folkstone; while the next four tides, less violent in respect to the rapidity of the waves, restored the accumulations. The same thing was observed at Dover and at Sandgate.

Whether the action of the waves is such as to accumulate the shingle upon the beach, or to destroy accumulations previously made, it is found that there is a general motion from west to east along the southern coast of England. Hence there is a liability of harbours being choked up when these shingle-banks approach. To keep off this evil, it has been customary to erect groins jutting out from the shore on the western side of such harbours. These groins are a sort of palisading, formed of piles and wooden planks, or of faggots staked down; they jut out from the shore to the distance of a few yards, and are intended either to break the force of the waves or to retard the progress of the shingle. Many such are to be seen along the coast near Folkstone. The circumstances which regulate the motion of the pebbles have not been very generally attended to; and it was part of Mr. Palmer's object to show that the erection of groins or piers jutting out into the sea could not permanently arrest the progress of the shingle towards the harbours.

If a wall or pier be extended from the shore into the sea, its effect in the first instance is to impede and prevent the progressive movement; and the shingle accumulates up against the pier until the angle formed by the pier and the line of the shore is occupied; and the pier being no longer an impediment to the progressive motion, that motion is again restored, and the general mass proceeds as if no impediment had existed. At the harbour of Folkstone, before the recent proceeding undertaken by the South-eastern Railway Company, this kind of action had been exhibited. Originally the shingle travelled along the line of cliff in the ordinary way; but groins or walls were built out from the face of the cliffs under the hope of driving the shingle out into deep water. The accumulation, however, immediately commenced, and continued until the angle between the barriers and the cliffs was quite choked up; after which the shingle travelled onward as before, and rendered the harbour more and more shallow and useless.

Mr. Palmer thinks that the movement of this shingle, and the consequent injury to the harbours on the southern coast of England, cannot be arrested by any local attempt at one particular spot, but must result from rather an extensive and combined system of operations. "The great objects in view must be attained, first, by securing permanently such accumulations as are necessary for the protection of land from the action of the sea, or useful by their addition to its surface; and, secondly, by facilitating and inciting the progressive motion of that superfluous quantity from whence the evils complained of are derived; and therefore the uninterrupted and permanent welfare of the numerous harbours which communicate with the sea, through the extensive tract of the shingle-beach, is dependent more as a system of management along the coast than upon particular devices adapted exclusively to each separate case."

Mr. Babbage, in his 'Bridgewater Treatise,' notices a remarkable feature observable in shingle-beaches, of ripple-marks, or undulations somewhat resembling the ruffled surface of water acted on by a gentle breeze. These, according to his explanation, are a consequence of one fluid flowing over another heavier than itself. He traces the same action in the heavens, and thinks that a "mackerel sky" is an example of ripple, caused by the passage of a current of air above or below a thin stratum of cloud, exciting a friction which raises the surface of the cloud into ripples or undulations. The ripple on the surface of water is occasioned by the friction of air passing over it. When a gentle breeze strikes the surface of the water at a slight inclination, it raises a small wave, which will extend in undulations to a great distance. This first wave, being raised above the general surface, will protect that part of the water immediately beyond it from the full effect of the wind, which will therefore again strike upon the water at a little distance; and, this, concurring with the undulation, will tend to produce another small wave, and thus again new waves will be produced.

The ripple-marks on sand are similarly explained by considering water to be the lighter fluid, and loose wet sand the heavier fluid; the former flowing over the latter. But in this case the ripple-marks do not disappear when the cause ceases to act, as they do when formed by air on the surface of water; they constitute the marks which we observe when the tide has receded from a flat sandy shore. If, after the formation of ripple-marks at the bottom of a shallow sea, some adjacent river or current deposit upon them the mud which it holds in suspension, then the former marks will be preserved, and new ripple-marks may appear above them. There are sand-hills near Etaples in France, which contain ripple-marks on a large scale; they are crescent-shaped hillocks, many of which are more than a hundred feet high; the height is greatest in the middle of the crescents, declining towards the points; and the slope on the inner side of the crescent, which is remote from the prevailing direction of the winds, is much more rapid than that on which it strikes.

[Bleak Hall.]

RAMBLES FROM RAILWAYS.

THE LEA.—No. VI.

IT was at Edmonton that John Gilpin and his wife should have dined. A painting of John Gilpin's ride is fixed outside a public-house in the town, and the house is commonly known as "Gilpin's Bell;" but we believe it is not the original Bell. It is not, however, without its associations. This is the house to which Charles Lamb used to accompany any of his friends who visited him, on their return; and here he used to take a parting-cup, generally of porter, with them. All who have read Talfourd's 'Life of Lamb' will remember two or three pleasant anecdotes connected with the custom.

About a mile from Edmonton, by the side of the Lea, at a place called Cook's Ferry, stands Bleak Hall, the house to which Piscator took his scholar, and which was then "an honest ale-house where might be found a cleanly room, lavender in the windows, and twenty ballads stuck about the wall; with a hostess both cleanly, and handsome, and civil." The old house is nearly all gone; the building at the right of our engraving being the only portion left, and that, though by no means modern, hardly appears so old as Walton's time. The present public-house stands by the towing-path on a cut of the Lea; and the landlady of it told us that the old Bleak Hall was pulled down several years back, when they built the house they now inhabit. That portion of the old house left standing was a kitchen, with a room over it (ascended by a staircase outside), called the "fishermen's locker," from its having been used as a locker for their tackle. If not the place Izaak Walton refers to, it must long have been a like hostel for Lea fishermen. The evidence appears to tell against its identity, but tradition is strong in its favour.* The road past Bleak Hall leads up to Chingford, a village beautifully situated on the edge of Epping Forest, with one of the prettiest and most rural churches near London. It stands on an elevation, and from its form, and being covered with ivy, imparts quite a rusticity of character to the neighbourhood. There is a very fine view from the churchyard.

Returning to the Middlesex side of the Lea we speedily arrive at the long straggling hamlet of Tottenham, the western extremity of which is called Tottenham High Cross, from a structure that stands on the east side of the high road. According to Lysons ('Environs of London,' iii. 518), Tottenham High Cross is mentioned in the 'Court Roll,' in 1346. It appears to have been originally a wooden cross, covered with lead; this becoming decayed and rotten, was taken down by Dean Wood, about 1600, who erected on its site an octangular brick column, terminating in a pyramid. This still remains, but in 1809 it was repaired by subscription, and covered with stucco and "gothicised." It is at Tottenham that we first make the acquaintance of the characters in the 'Complete Angler,' and the cross is several times spoken of in the course of the work. What a treat it must have been to be greeted by the happy old man with a "welcome to Tottenham High Cross," and with him to "rest ourselves in this sweet shady arbour (alas! there is none such *now* at Tottenham Cross) which Nature herself has woven with her own fine fingers; it is such a contexture of woodbines, sweetbrier, jessamine, and myrtle, and so interwoven, as will secure us both from the sun's violent heat, and from the approaching shower; and being sat down" to partake with him of "a bottle of sack, milk, oranges, and sugar, which all put together make a drink like nectar, indeed. too good for any but us anglers:" and then hear him proclaim his delight in simple rural enjoyment, in such lines as these—

"Abused * mortals, did you know
Where joy, hearts-ease, and comforts grow,
You 'd scorn proud towers,
And seek them in these bowers;
Where winds sometimes our woods perhaps may shake,
But blustering care could never tempest make,
Nor murmurs e'er come nigh us,
Saving of fountains that glide by us."

Farewell, Izaak! We here quit the last place associated with thy name, and we have spoken of thee so much that we must not more than allude to thee again, lest even thy pleasant name become wearisome. We have known thee long, and talked much of thee; henceforth our acquaintance must be confined to ourselves.

Let us return to our stream; and there is nought on either hand to call us away from it again for some time. The river is here very beautiful, and especially after passing Tottenham Mill, the old course of the

* It is generally called Bleak Hall, and is pointed out and engraved in Sir H. Nicholas's Notes to the 'Complete Angler,' and elsewhere, as the original Bleak Hall of Izaak; but, unless he made a slip of the pen, it cannot be so; for in the conversation on the night spent there (chap. v.), Peter says, "Coridon and I will go up the water towards Ware," "And my scholar and I," replies Piscator, "will go *down* towards Waltham;" whereas this is some miles *below* Waltham. Walton's Bleak Hall was probably somewhere about Broxbourne; most likely not far from Want's Inn. In Major's edition of the 'Complete Angler' the Rye-house is figured as Bleak Hall, but neither as respects situation, nor in any way, does it answer to the description.

* *i. e.* deceived.

Lea affords many a charming little picture. An old pollard willow with an angler under its shadow—a few cows, perhaps, standing in the water, and enjoying with philosophic quiescence the cooling luxury—perchance a punt in the middle of the river—a bright blue sky over head, reflected with a softened lustre in the clear stream—an abundance of yellow water-lilies at our feet—and the low banks decked with all gay flowers—these are the materials of the picture; and he who has not his heart gladdened as he gazes on them has yet to learn that there are things in heaven and earth not dreamt of in his philosophy. Walton was not one of these:

> "The meanest flow'ret of the vale,
> The simplest note that swells the gale,
> The common sun, the air, the skies,
> To him *were* opening Paradise."

And only such as, in a measure, can participate in these feelings and sympathies are fitted to wander along Izaak Walton's Lea.

Near Lea Bridge, the *Ultima Thule* of incipient cockney fishermen, is the Horse and Groom, the favourite fishing-house of those of maturity in the gentle art. The grounds are picturesque, and the waters well stocked with fish. The fishery along the Lea is carefully preserved, with the exception of two or three intervening spots, from Ware to Temple Mills; and let out for the most part to the persons who rent the several public-houses on its banks. From these the angler obtains permission to ply his cunning, on payment of a yearly subscription: the occasional angler pays by the day. By Lea bridge the East London Water Company have an engine-house, and a canal runs from it, parallel to the towing path of the Lea, to their works at Old Ford, a distance of about three miles. A little on our right is Low Layton, by some supposed (as we mentioned before) to be the Roman Durolitum, from which its name has been thought to be corrupted: but its name is plainly derived from that of the river. In the church is a monument to John Strype the antiquary, who died at the ripe old age of ninety-four; having been curate or minister of Layton ("without institution or induction," as Morant is careful to tell us) above sixty-eight years. He was an unwearying writer, having published thirteen folio and several octavo volumes on antiquities, besides others on divinity. John Bowyer the celebrated printer was also buried here.

Following our river in its windings along the meadows, we pass the White-house fishery and soon reach Temple Mills, between which and Bromley are the channels spoken of above as being, in the opinion of Spelman, Hawkins, and others, those made by Alfred when he altered the course of the Lea. They have all the appearance of being artificial, and so have those about Waltham; is there any reason why both should not have been formed by him?

A mile or two further brings us to Old Ford, so called from the ancient road into Essex having here crossed the Lea. The works and basins of the East London Water Company are situated here and cover an enormous extent of ground. On the road by the water-works there is a tea-gardens, called Clare Hall, that was formerly much frequented by London tradesmen; a machine with painted figures being provided for their amusement, which was described by its contriver as a mill for grinding old people young. But we suppose the march of intellect has lowered the reputation of this miller. Not long after passing the water-works we come to Bow Bridge, a neat granite structure, erected within the last seven or eight years, in the place of an extremely old bridge, of the origin of which we have the following account in Lysons:—"At an inquiry taken before Robert de Retford and Henry Spigurnell, the king's justices in the year 1303, 'the jurors decided upon their oath, that at the time when Matilda,* the good queen of England, lived, the road from London to Essex was by a place called the Old Ford, where there was no bridge, and during great inundations, was so extremely dangerous, that many passengers lost their lives; which coming to the good queen's ears, she caused the road to be turned where it now is, namely, between the towns of Stratford and Westham; and of her bounty caused the bridges and road to be made.'" The bridge afterwards fell into ruins and remained in a dangerous state, "till Queen Elinor of her bounty ordered it to be repaired, committing the charge of it to William de Capella, keeper of her chapel." Bow Bridge was much raised in the centre, so much that the name of the place, Stratford-le-Bow, is said to have arisen from its form. It was a curious old bridge, more curious perhaps than old London Bridge, and being narrow and without a foot-path, a wooden foot-bridge was affixed to one side of it. Chaucer mentions Stratford-le-Bow in the prologue to his 'Canterbury Tales:'—

> "Frenche she spake full fayre and fetisly,
> After the scole of Stratford atte Bowe,
> For Frenche of Paris was to hire unknowe."

Bow church, which stands in the centre of the road on the London side of the bridge, is an ancient edifice, having been erected in the early part of the fourteenth century. It was thoroughly repaired a few years back; before the reparation its appearance was most venerable. It is still an interesting structure.

[Tottenham High Cross.]

After leaving Bow our river flows past Bromley, whose church, situated at a very short distance from that of Bow, is a little countrified building. But by this time our river has ceased to be either picturesque or interesting: lime-kilns, calico-printing and chemical works, and distilleries are the most prominent objects along its banks; and however useful these may be, they are not agreeable to either nose or eye. The walk, indeed, after passing Bromley-mills is pretty—the Thames with its shipping and Shooters' Hill as a back-ground, serving to produce some rather striking pictures. But we must pass onwards; our river is crossed near Blackwall by an excellent iron bridge; and, leaving the East India Docks a little on its right, it soon unites with the Thames—having, however, first lost its name, which it has changed for that of Bow

* This is the same Matilda who built the bridge at Cobham mentioned in our account of the Mole, *ante*, p. 149.

Creek. It enters the Thames somewhat below the terminus of the Blackwall Railway, and opposite the Greenwich marshes. Here then we part with the LEA; and though we have perhaps found nought in it to arouse our minds to feelings of grandeur, we have not wanted for that which has served to excite pleasurable sentiments, and to call up many agreeable associations. We almost, indeed, feel tempted in quitting it to apostrophize it as did Moses Browne in his 'Piscatory Eclogues:'—

"Sweet stream,
Whose scenes to solemn thoughts invite,
May our calm life resemble thee,
Such pleasure give, so useful be!"

USES OF THE DIAMOND IN THE ARTS.

THE diamond, like most other natural productions, is applied to various uses in the arts of life, according to the facilities afforded by its chief qualities or characteristics. Most of these uses, as we shall see by the following details, depend on the excessive hardness of the diamond, a hardness greater than that of any other product, either of nature or of art. It is to a series of papers written a few years ago, by Mr. Turrell, that we shall be chiefly indebted for our notice of this subject.

As an article of jewellery, we cannot speak of the diamond as an *useful* substance so much as an *ornament;* but the very operations which bring the diamond into an ornamental form are such as illustrate the uses of the diamond in other respects, so that it in some measure belongs to our present purpose. When a rough diamond, such as exists in nature, is prepared for ornament, it is brought into one or other of the four forms called *brilliant, rose, table,* and *lasque.* The brilliant is held in the highest estimation, as it is the form which shews to the greatest advantage the peculiar lustre of the gem; its shape may be said to consist of two truncated pyramids united by one common base, the upper pyramid being much more deeply truncated than the lower; and the surface is cut away in *facets* or small flat surfaces in such a manner as to reflect light very brilliantly. The rose diamond is the form given to those gems whose depth or thickness is too small to allow them to be brilliant-cut; it is produced by giving to the surface of the diamond a series of little equilateral flat surfaces or facets. The table diamond, being still thinner than the rose, has a flatness of form which gave rise to the name. The lasque is a peculiar form given to the diamond in India.

Now to give these various forms to the rough diamond, a laborious and skilful process of splitting, cutting, and polishing, is followed. The diamond can only be rubbed or worn away by another diamond, but it may be *split* by other means. The splitting is usually preparatory to the cutting and polishing. To effect it, the diamond is fixed into a ball of cement, about the size of a walnut; the cement is formed of a kind of resinous substance brought from Holland, and the diamond is imbedded in it (while warm) so far as to leave uncovered that part which is to be separated. Another diamond, having a sharp edge, is fixed in another ball of cement, and with this edge a slight gap or notch is made in the stone to be split. Into this notch is placed the extreme edge of a blunt razor blade, and a smart blow with a hammer splits off the portion of diamond which projects beyond the surface of the cement. If a notch were not first made by another diamond, the edge of the razor would yield without splitting the gem; and even with this notch the process requires much dexterity and previous arrangement.

Then comes the more tedious and elaborate process of cutting or grinding the facets on the surface of the diamond. The diamond is imbedded in a ball of cement, fixed at the end of a stick, that part of it being left exposed which is to be worked. Another diamond, also about to be cut, is imbedded in cement at the end of another stick; and the two diamonds are rubbed against each other in a very singular manner. The workman has before him on a bench a very small mahogany box, on the top edge of which is a rim of steel, with two steel pins rising perpendicularly; these pins act as fulcia against which he holds the sticks, and he rubs the two diamonds very forcibly against each other until each one has worn away a portion of the surface of the other. "Diamond cut diamond," has become an adage, and it is certainly true that this gem can only be worn away by one of its own kind. The fine dust which is worked off in this process, and which is called *diamond powder*, is so valuable a commodity in some of the arts, that every grain of it is preserved with scrupulous care: the workman holds the two diamonds over the small box, and the powder falls on a perforated steel plate, through the perforations of which it falls into the lower division of the box. When one facet has been produced on each stone in this way, the stones are removed from the cement, and readjusted in a new position, for the renewal of this slow and tedious process.

When the facets are produced, the polishing of the diamond next ensues. The diamond is held in a manner different from that just described; instead of being imbedded in cement, it is imbedded in pewter or fusible metal, to such a depth as to leave no part exposed but the facet which is to be polished. The pewter is contained in a little hemispherical cup, and together with it forms the *dop*. This dop is placed, with the diamond downwards, on the surface which is to polish it. A circular cast-iron plate, called a *skive*, about a foot in diameter, is first turned flat and true in a lathe, then slightly roughened with grit stone, and then fixed to a lathe or mill so that it may rotate rapidly in a horizontal direction. Some diamond-powder mixed with olive oil is spread on the upper surface of the skive, and the dop is laid on with the diamond in contact with this surface, a weight more or less heavy being pressed on it. The skive being then made to rotate, the continued friction between the diamond and the layer of diamond-powder polishes the little facet on the former. The minute precautions requisite in this process are quite remarkable.

Thus it will be seen that in splitting, in cutting, and in polishing the diamond, other diamonds, or fragments or powder of diamonds, are indispensable. The hardness of substance which renders this necessary gives rise to the other uses of the diamond in the arts. For these purposes such stones as are too small or too badly coloured to be used for jewellery are appropriated; they are called by the general name of *bort*, and from this bort the glass-cutters, glaziers, seal-engravers, dentists, copper-plate-engravers, lapidaries, china-menders, and mathematical-instrument-makers, derive advantages which no other substance could give them.

The process of cutting glass by means of the diamond is a curious one. Dr. Wollaston wrote a paper on the subject, in which he observed:—"When we consider how long the diamond has been in common use for the purpose of cutting glass, it is rather surprising that no adequate explanation has been given of that remarkable property, and that even the conditions on which the effect depends have not been duly investigated. Many persons, indeed, are not aware of the distinction that is to be drawn between *scratching* and *cutting*. In the former, the surface of the glass is torn into a rough furrow; in the latter, a small fissure or superficial crack is made, which should be continued without interruption, from one end to the other of the

line in which the glass is intended to be cut. The skilful workman then applies a small force solely at one extremity of this line, and the crack which he forms is led by the fissure, almost with certainty, to the other. Another substance, harder than glass, possesses the power of *scratching*, in common with the diamond. But the power of *cutting* has been thought confined to the diamond; and it is true that its peculiar hardness certainly contributes to the duration of that power." The diamonds selected for this purpose are such as are in the naturally crystallized state, without having been cut or ground by art. It is supposed that the natural edges which divide the planes of crystallization are more calculated to cut the glass than any artificial edges. The actual cutting is effected only at the extreme surface of the glass, and consists in a fissure of exquisite minuteness, which serves to guide the rent whereby the complete severance of the glass is brought about. There is a particular direction in which the diamond must be applied to the glass in order to make a cut, any other direction enabling it merely to scratch and not to cut; and those who are employed in setting diamonds for this purpose so adjust them in their handles that the user may be guided in the proper way of holding them.

The minuteness of the fissure made by the diamond has given rise to some remarkable and beautiful ornaments, called *iris* ornaments. Mr. Barton, of the Royal Mint, some years ago constructed a delicate machine by which he could make, with the point of a diamond, two thousand lines in an inch, on a surface of hardened and polished steel. Such lines, by a peculiar property in the reflection of light, produce a brilliant series of colours over the whole surface of the plate, although the lines themselves are wholly invisible to the naked eye.

The jewelling of watches is an occupation in which the diamond is always employed. It is not that the diamond itself is always made to form part of the minute mechanism of the watch; but it is employed as a working-tool where no other working-tool would be available. The numerous little pivots in a watch, connected with the various wheels, if they worked in holes formed in pieces of metal, would soon wear away the metal, and become disarranged. A harder substance is therefore provided for the pivot-holes, and this substance is generally a gem so hard that it can hardly be worked into form by any means but by the diamond. The small fragments of ruby or other gems are first cut or slit into thin plates, then pierced by very fine diamond drills, then brought to a circular form, and lastly have the holes polished by means of diamond-powder. The diamond is the effective agent in all these processes; for diamond-powder is applied to the edge of the metal wheel whereby the ruby is split, a minute fragment of diamond is used as a drill to pierce the hole, diamond-powder is used to grind and polish the surfaces of the thin plates of ruby, another fragment of diamond is used as a turning-tool to give a circular form to the ruby, and diamond-powder is again used to polish the hole pierced through it. The fragments of diamond used as cutting-tools in these processes are so excessively minute, that it requires the utmost delicacy on the part of the workmen to manage them, and fix them to the various pieces of apparatus.

Copper-plate-engravers frequently find it necessary to increase the strength of their tints, by re-entering the lines with a point; and this is commonly effected by the common steel etching-point, ground or set to a particular form. Many of the eminent engravers of recent times, however, employ a diamond for this purpose, on account of the want of durability in steel points, whereby the tints become very unequal. A small fragment of diamond is brought, by the use of diamond-powder, to the required form, and is fixed at the end of an appropriate handle. These diamond points are sometimes very useful in etching, and also in ruling parallel lines in particular parts of a plate.

Mr. Barton employed the diamond very successfully as a turning-tool. On one occasion, at the request of Mr. Troughton, he succeeded, by means of a small diamond tool, in cutting from a cylindrical surface a quantity not more than a twelve-thousandth part of an inch in thickness!

Jewelled draw-plates for wire are another production which we owe to the diamond. It is pretty well known that all kinds of wire are made by drawing a rod of metal through a hole somewhat smaller in diameter than itself, the metal being squeezed and compressed while passing through the hole. It is a natural feature in this arrangement, that the plate in which the hole is bored must be harder than the metal which is to be formed into wire; and it is easy to imagine that the substance of the plate must have a tendency to wear away rapidly. In making fine wire the hardness of the draw-plate is of especial importance; and hence the employment of hard gems and precious stones. Rubies have been sometimes so shaped as to give form to steel pendulum wire for chronometers; and the ruby, the cryso-beryl, and other gems, have occasionally been employed as draw-plates for the production of very fine wire. In all such cases it is by means of drills made of small fragments of diamond, or diamond-powder, that the gems are prepared for this purpose.

The diamond has been used as a lens for microscopes, and as a tool for shaping other gems into the form of lenses. Sir David Brewster was the first to suggest the employment of gems in this way; Mr. Hill of Edinburgh was the first to make lenses of ruby and of garnet; and Mr. Pritchard was the first to make a similar application of the diamond. The lenses made of these costly materials have optical properties which render them especially valuable for microscopic purposes; but the amount of labour and of skill involved in their production is truly enormous, and strikingly illustrates the hard texture of these gems. Sir David Brewster states that fifty or sixty hours' incessant working are necessary to bring a diamond to the required form for a double-convex lens for a microscope.

The last mode of employing the diamond to which we shall here allude is in the process of seal-engraving. This is a singular operation, in which diamond-dust is the real working agent. The cornelian or other piece of stone which is to form the seal has the device first slightly sketched on it, and the device is then worked in intaglio by means of small tools touched with diamond-dust mixed with oil. The small tools, which are made of iron, and which are variously shaped according to the kind of cuts to be produced, are made to rotate very rapidly by means of a lathe; and the engraver holds the piece of stone in such a position as to be acted on by the small tool, viewing the progress of his labours by means of a magnifying-glass. The diamond-powder, applied to the surface or edge of the tool, cuts away the stone; but, as may be supposed great delicacy, and great variety of tools, are necessary to the production of the very minute lines which form the device in a seal.

It will thus be seen that the excessive hardness of the diamond gives it an extensive range of usefulness in the arts.

ON THE TERMS STANDARD, STERLING, AND CARAT.

[Concluded from p. 240.]

HENRY VIII. was the first English monarch who appears to have adopted this unworthy course. Notwithstanding the immense wealth which his father left

him, it was dissipated in a few years by the prodigal expenses of the youthful monarch. He issued numerous proclamations from time to time, stating the current value that should be placed upon coins; which current value, to suit the king's object, became more and more in excess of the real value. It was always a present advantage to the king when these changes were made, because it lessened the intrinsic value of the payments to be made from the treasury; but as the government was sure in the end to share the loss with the public generally, the advantage became only temporary, and the plan was therefore renewed from time to time. The object was generally wrought out by declaring how many pounds sterling (represented by the symbol £) should be coined from a pound weight troy (lb.) of pure gold; and how many shillings from a pound weight of pure silver; so that alloy had to be introduced in sufficient quantity to make the coins of nearly the usual size and weight. At one time a pound troy of pure gold was to be made into about 28*l.* coinage, then into about 33*l.*, then into 36*l.*; so that a lb. of gold bore a varying relation to a £ in money, whereby the commercial arrangements of the country were quite disarranged.

The standard of silver was debased in a yet greater degree. At one time forty-four shillings were to be coined from a pound weight of pure silver; then about fifty-eight, then ninety-six, and at length a hundred and forty-four; that is, although the coin called a shilling continued to be of the same weight, yet by varying the quantity of the alloy of copper (whose value in this way is too insignificant to be taken notice of), the silver became less and less in quantity in the shilling, and the intrinsic value proportionably reduced.

When Edward VI. succeeded his father, the regency continued this pernicious system; but the young king set about restoring the standard by degrees. Many of the changes were of a complex character, since both weight and fineness were taken into account in the determination of the value of each coin. It is therefore only by taking both qualities together that we can compare the coins of different periods. The relative value of the precious metals to each other, and to other commodities, has also greatly varied; so that taking all these things together, the changes may perhaps best be shown by a few examples, thus:—one pound troy of the silver which happened to be standard at the time, was coined into 1*l.* 1*s.* 4*d.* in the time of William the Conqueror, 2*l.* in the reign of Edward IV., 3*l.* in the reign of Elizabeth, 3*l.* 6*s.* in modern times; one pound troy of standard gold (the particular standard adopted at the respective times) was coined into 14*l.* 0*s.* 10*d.* in the reign of Edward III., 22*l.* 4*s.* 6*d.* in that of Edward IV., 36*l.* in that of Elizabeth, 44*l.* 10*s.* in that of Charles II., and 46*l.* 14*s.* 6*d.* in recent times; while the relative value of silver to gold was 1 to 12 in the time of Edward III., 1 to 10 in that of Edward IV., 1 to 5 in that of Henry VIII., 1 to 11 in that of Elizabeth, 1 to about 14½ in modern times.

We thus find that the term *standard*, which ought to mean an invariable model for general reference, has been subject to many fluctuations; but its present meaning in England may be put in a condensed form, thus:—

1. The standard of fineness in gold coinage is attained when there are 11 parts of pure gold to 1 of alloy.
2. The standard of weight in gold coinage is attained when 46⅔ sovereigns are coined from one lb. troy of standard gold.
3. The standard of fineness in silver coinage is attained when there are 37 parts of pure silver to 3 of alloy.
4. The standard of weight in silver coinage is attained when 66 shillings are coined from one lb. troy of standard silver.

The word *sterling* is another of those employed in relation to money matters, and one concerning which there has been much diversity of opinion. Whenever or by whomsoever the term was introduced, it has always been used to express the lawful current money of England, and it is so understood all over the Continent. It seems to have been intended at first that a pound weight in silver and a pound tale in money (that is, lb. and £) should be equal and equivalent; but this equality was soon departed from, and the word sterling came to indicate the current coin, whether it departed much or little from the relative position with respect to silver.

The opinions concerning the origin of the word 'sterling' have differed in the most extraordinary degree. Some writers have deduced it from a company or body of merchants called *Easterlings*, who shortly after the Norman Conquest were employed in regulating the coinage. Others trace the word to *stare* or *starling*; others think it comes from *little star*; others deduce it from the name of the town of *Stirling* in Scotland; others from an Anglo-Saxon word for a *rule* or *standard*; others from an Anglo-Saxon word denoting a royal or noble standard; but the greater number who have touched on this point, including Stow and Camden, seem to think that the derivation from *Easterling* is most likely to be the correct one. The date at which the term was first used has been not less a subject of controversy; the times stated by different writers being A.D. 860; A.D. 928; about William the Conqueror's time; about Henry II.'s time; in the 33rd of Henry II.; in the reign of Richard I.; before the reign of John; before or in Henry's III.'s time; in Henry III.'s reign; in Edward I.'s reign.

But whatever be the origin of the word sterling, or the date of its introduction, we shall be pretty nearly correct in saying that it is a short expression for the words "English coined money." In the year 1606, when a little confusion arose in Ireland from the use of silver coins of different standard, and from the words "sterling money" being applied to both kinds, it was ordered that that kind only which corresponded with English money in standard should be called *sterling* or *sterling money*, while that of a different standard should obtain the name of *current* or *Irish current money*. This example conveniently illustrates the general meaning of the word sterling.

The Junction of the Indus and the Cabul.—We walked to the banks of the Indus to see its junction with the Cabul river, a stream of equal breadth with itself, but inferior in volume. At their confluence the water was lashed into a sea of breakers, dashing over rocks and whirling in tremendous eddies, sufficient to have swamped a tolerably large boat; but the scene, as it was presented to our view, no doubt owed much of its grandeur to the accumulated rain that had fallen during our stay at Boorhân, and may be very similar to what it assumes during the periodical monsoons. Both the streams were considerably swollen, and opposed strong contrasts to one another, the Indus being perfectly clear and pure—the Cabul river, thick and muddy; the discoloured water of the latter being distinctly traced for two or three hundred yards below the spot where it flows into the Attock. We watched this deeply-interesting picture from some overhanging rocks, which bear on their surface such a high state of polish, that they have the appearance of being perfectly wet; but it arises, I conjecture, from the constant trituration of the sand, washed upon them during the rainy seasons. From the sharpness of their angles, and the darkness of their hue, I concluded they were composed of an extremely hard stone; but a few blows from a stick easily separated a portion, the fractures assuming regular shapes of a slaty substance.—*Lieut. W. Barr's Journal of a March from Delhi to Peshawur, &c.*